# Monday, November 21st

Reminder: Quiz tomorrow on Sections 5.2 to 5.5

- Review Section 5.4 (discrete and continuous data...and graphing data)
- Finish, Check, and go over questions Pg.286 #1,2
- Begin Section 5.5 (what is the domain/range read from a graph and is the graph considered to be a function).

Quiz on Tuesday on Sections 5.2 to 5.5

## 5.5 Graphs of Relations and Functions

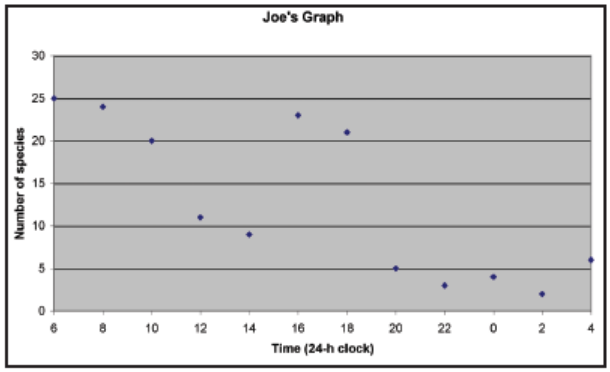
| LESSON FOCUS | Determine the properties of the graphs of relations and functions. |
|---|---|

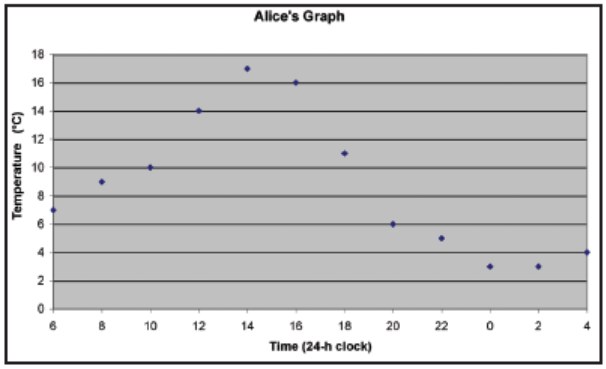
### Make Connections

In an environmental study in Northern Alberta, Joe collected data on the numbers of different species of birds he heard or saw in a 1-h period every 2 h for 24 h. Alice collected data on the temperature in the area at the end of each 1-h period. They plotted their data.

Does each graph represent a relation? A function? How can you tell?

Which of these graphs should have the data points connected? Explain.






## TRY THIS

Work with a partner.
You will need grid paper.

**A.** Each of you chooses one of these tasks:

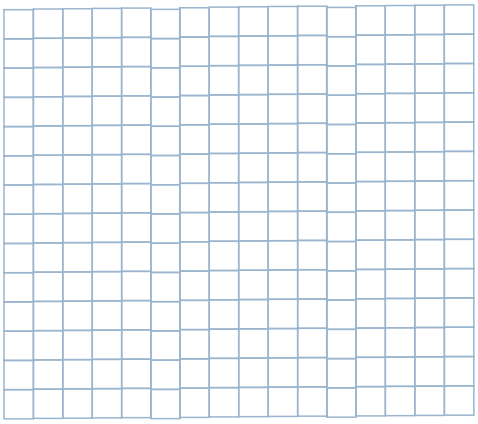
- A sugar cube has a volume of 5 $cm^3$ and a mass of 4 g. Graph the mass of sugar as a function of the number of sugar cubes from 0 to 5 sugar cubes.
- Five cubic centimetres of loose sugar also has a mass of 4 g. Graph the mass of sugar as a function of the volume of sugar from 0 to 25 $cm^3$ of loose sugar.

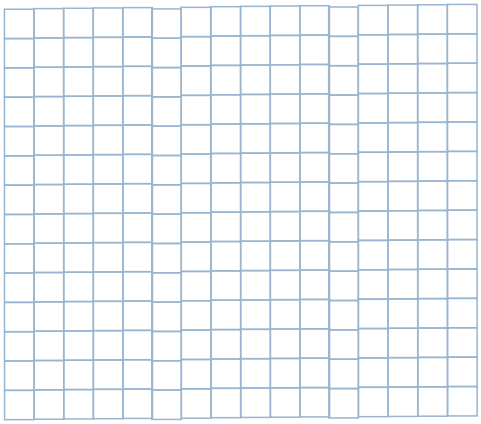
**B.** Share your results. How are your graphs alike? How are they different?

**C.** Work together:

- Identify the dependent variable and independent variable for each function. How did you decide on which axis to graph each variable?
- How did you decide whether to connect the points?
- Are there any restrictions on the domain and range? Explain.

- A sugar cube has a volume of 5 $cm^3$ and a mass of 4 g. Graph the mass of sugar as a function of the number of sugar cubes from 0 to 5 sugar cubes.
- Five cubic centimetres of loose sugar also has a mass of 4 g. Graph the mass of sugar as a function of the volume of sugar from 0 to 25 $cm^3$ of loose sugar.





How are the graphs alike? How are they different?



Identify the dependent variable and independent variable for each function. How did you decide on which axis to graph each variable?

How did you decide whether to connect the points?

Are there any restrictions on the domain and range? Explain.

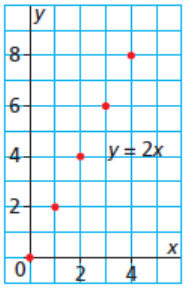
We can represent the function that associates every whole number with its double in several ways.
Using a table of values:

| Whole Number, $x$ | Double the Number, $y$ |
|---|---|
| 0 | 0 |
| 1 | 2 |
| 2 | 4 |
| 3 | 6 |
| 4 | 8 |

The table continues for all whole numbers.
The domain is ?
The range is ?



Using a graph:



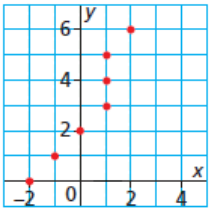

We know the relation $y = 2x$ is a function because each value of $x$ associates with exactly one value of $y$, and each ordered pair has a different first element.

The *domain* of a function is the set of values of the independent variable; for the graph above, the domain is ?

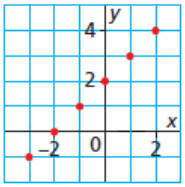
The *range* of a function is the set of values of the dependent variable; for the graph above, the range is ?

When the domain is restricted to a set of discrete values, the points on the graph are not connected.

A relation that is not a function has two or more ordered pairs with the same first coordinate. So, when the ordered pairs of the relation are plotted on a grid, a vertical line can be drawn to pass through more than one point.




A function has ordered pairs with different first coordinates. So, when the ordered pairs of the function are plotted on a grid, any vertical line drawn will always pass through no more than one point.



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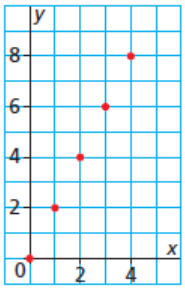
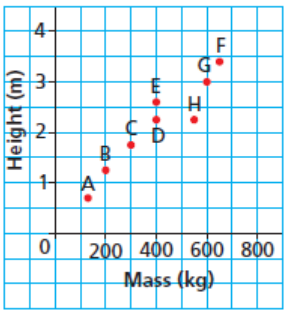
## Vertical Line Test for a Function

A graph represents a function when no two points on the graph lie on the same vertical line.
Place a ruler vertically on a graph, then slide the ruler across the graph. If one edge of the ruler always intersects the graph at no more than one point, the graph represents a function.



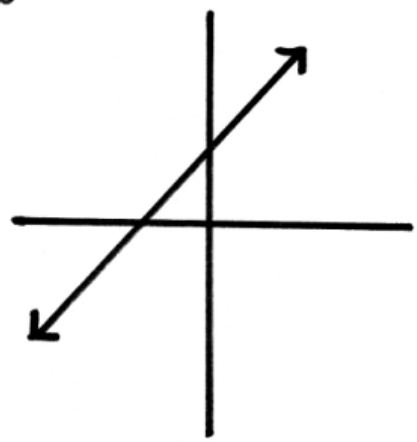
**Before we begin....A Reminder:**

Domain - All the possible x values
Range - All of the possible y values

## We will be talking about 3 different types of functions:

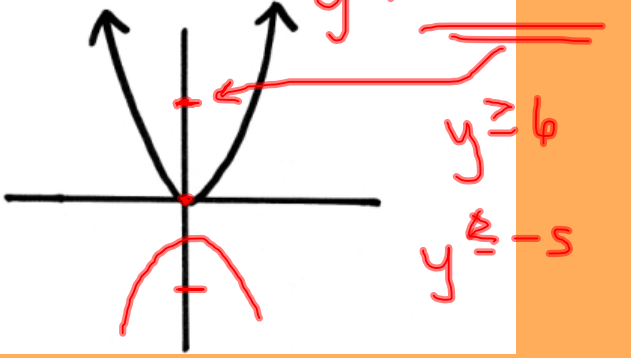
Linear Function: $y = mx + b$

Domain: $x \in R$
Range: $y \in R$



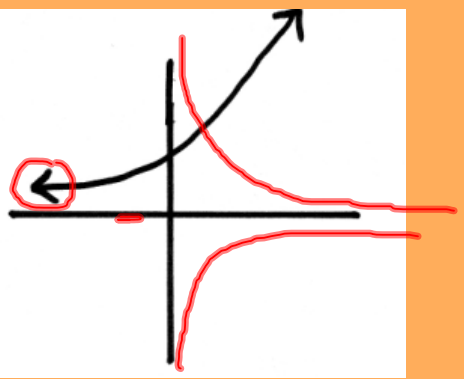
Quadratic Function: $y = ax^2 + bx + c$

Domain: $x \in R$
Range: $y \geq 0$




Exponential Function: $y = a^x$

Domain: $x \in R$
Range: $y \neq 0$



(1, 2) (3, 4) (5, 1) (2, 8) (3, -2)

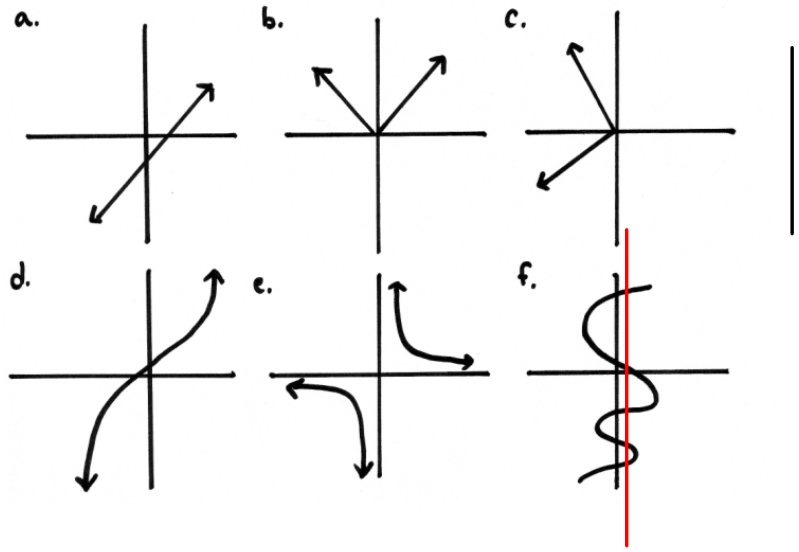
## Section 5.5

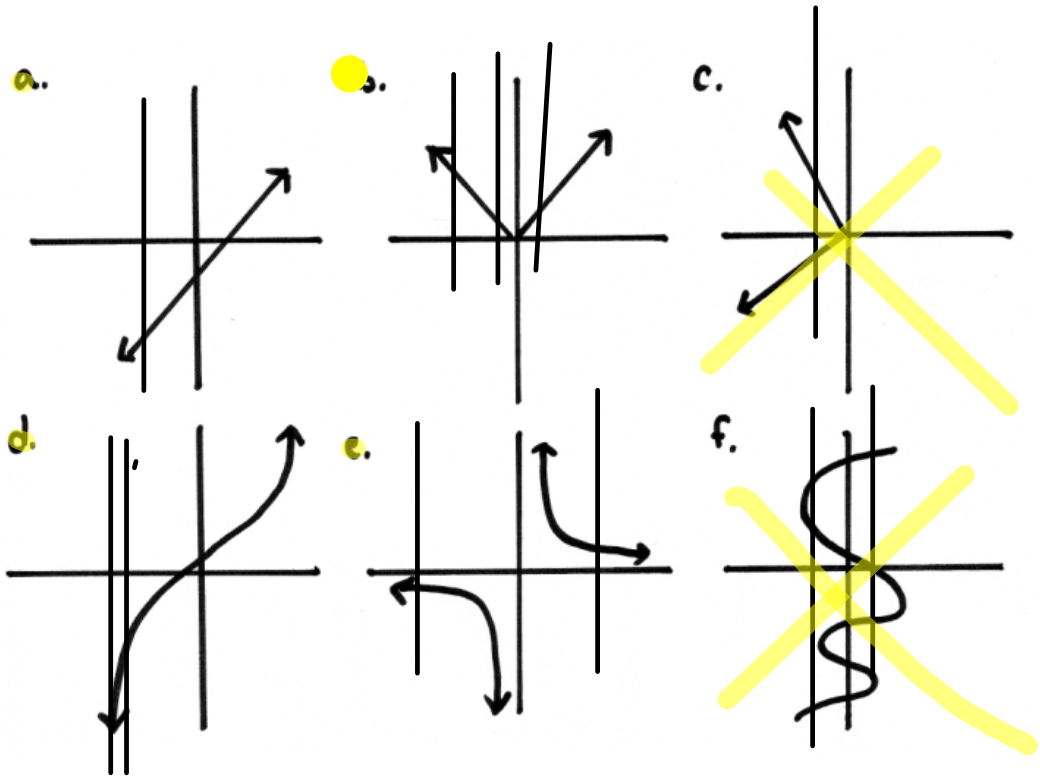
A **vertical line test** helps us determine if a graph is a function or not.

Remember, a function has only one y value for every x value.

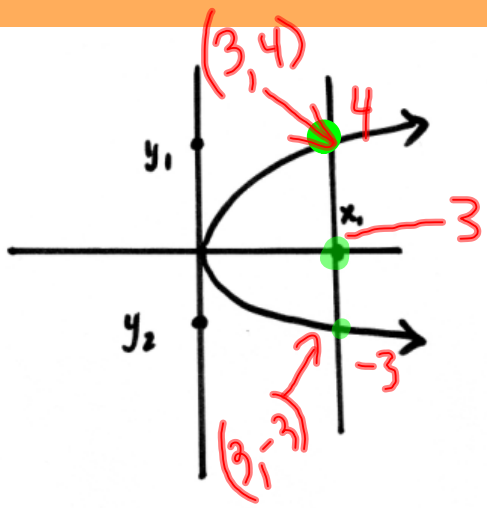
If a graph **is** a function, when we draw a vertical line through it, it will only intersect the graph once.

**Which of the following are functions?**






**A function is a relationship where for every x value there is only one y value.**




Not a function !

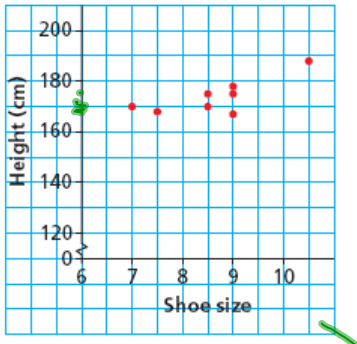
There are two y values for one x value.

## Example 1 Identifying whether a Graph Represents a Function

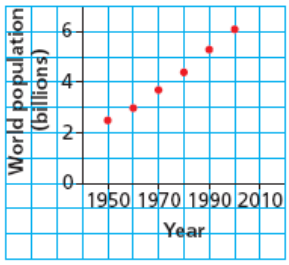
Pg. 290

Which of these graphs represents a function? Justify the answer.

a) Height against Shoe Size




b) World Population




CHECK YOUR UNDERSTANDING

**SOLUTION**

Domain (x-values) (7, 7.5, 8.5, 9, 10.5)

Range (y-values) (167, 169, 170, 175, 178, 188)

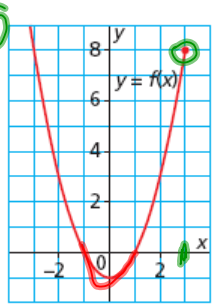


## Example 2 Determining the Domain and Range of the Graph of a Function

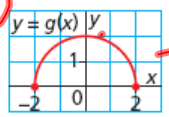
Pg. 291

Determine the domain and range of the graph of each function.

a)




b)




Domain $-2 \leq x \leq 2$

Range $0 \leq y \leq 2$

CHECK YOUR UNDERSTANDING

**SOLUTION**

Domain (x-values) $(x \leq 3)$

Range (y-value) $(y \geq -1)$

→ Finish Pg. 286 #1, 2 ✓

→ Pg. 294 #~~7, 8~~ 4-8